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Article received on:

30/04/2014

Accepted for publication:

05/11/2014

Received after proof reading:

17/01/2015

HUMAN SPERM COUNT DETRIMENTAL EFFECTS OF OCCUPATIONAL AND ENVIRONMENTAL FACTORS

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ABSTRACT... Objectives: Reports from many parts of the world suggest that chemical and physical agents in the environment, introduced and spread by human activity may affect fertility in men. The objective of this article is to highlight the environmental factors and their association to male sperm quality and count as well. **Materials and Methods:** This study focusing on exposure to environmental factors affecting the semen quality of the workers working in different factories for a period of 5 to 7 years in Lahore. **Results:** The results from this study suggest that there are many environmental factors which may affect semen quality and sperm count. It is necessary to prevent parental exposure to the agents associated with those hazards.

Key words:

Environmental factors, Semen quality, Environmental exposure

Article Citation: Sultan J, Kokab, Ahmed M. Human sperm count; detrimental effects of occupational and environmental factors. Professional Med J 2015;22(1):013-017.

INTRODUCTION

The environmental pollution is a major health issue that affects the health of millions of people worldwide especially in developing and underdeveloped countries. Environmental pollution, which is usually caused by human and non human activities, is one of the major contributing factors for the pollution of the healthy natural environment. There are various types of contaminants that cause contamination of natural environment, i.e. pollution of soil, different toxic gases in the healthy natural air and contamination of water resources. Improper disposal of human wastes such as garbage, sewage and others are the major factors which pollute canals, rivers and ocean waters. Some other factors that pollute natural environment include heavy traffic noise pollution, pollution caused by light and contamination of environment by different plastic made items¹.

Pakistan is facing one of its major issues in the form of rapidly growing population that is contributing in the worsening health related problems. Over population has taken the country to more than 180 million people today. The country's natural resources and natural healthy environment basic infrastructure is becoming overburdened due to overpopulation. Industrial pollution because

of a lot of industries, urbanization, soil erosion and land degradation are major factors that are contributing to health concerns². Overuse of natural resources of water and soil has resulted in degradation of environmental resources leading to detrimental effect on natural resources and health. Environmental pollution is one of the most serious problems faced by humans and other living beings whether animals or plants on earth. Wasted plastic made things like bags, sheets, toys and even dishes are one of the major environment pollutants³.

Electronic devices seem to be another hazard for the men fertility and sexual health. Be it via laptop computers with Wireless LAN, mobile phones or smart phones, everybody seems to be electronically connected to others all the time. Fertility is an area which is affected by these devices, since many men keep mobile phones in their trouser pockets in proximity to their testes could be a factor causing decrease sperm count and motility⁴.

Polycyclic aromatic hydrocarbons (PAHs) are wide spread pollutant in the environment that are generated by incomplete burning of organic substances like fuel or other combustible

substances. Many reports showed high detection rates of PAHs metabolites in different races and genders, reflecting exposure to the parent compounds, in the general population on mass scale. With the rapid increase of automobile and industrial production, the general population has become more prone to be exposed to PAHs in heavy populated areas of Pakistan⁵.

Cigarette smoking is also a major health concern which has a positive relation affecting fertility factors like decrease sperm count, oligospermia, and etc⁶.

MATERIALS AND METHODS

The study was carried out on 400 samples during the period from July 2012 to December 2013, obtained from different age groups of volunteers working in different industries like textiles, garments, processing of food, paints, wood, paper, plastic and chemical, near Manga Mandi and Raiwind Road Lahore. This industrial area is having more than thousand factories, units and small production plants. The volunteers in this study were asked to fill and sign a consent form which included questions regarding cigarette smoking, age, taking alcohol and diet. The questions about drug addiction and previous history of illness were asked. All individuals were healthy and were not suffering from any disease. All other factors which affect semen quality were excluded from this study until they don't interfere with the results such as varicocele, inguinal hernia, pubertal mumps, smoking, alcohol drinking and others.

All the participating subjects were divided into 4 groups on the basis of number years working in the factory, nature of their work, sperm count, sperm agglutination and normal morphology of sperms in the samples. Statistical analysis, variance analysis and correlation studies were conducted⁴.

The men were divided into four groups. Working in textile industry group 1 (n=150), Plastic work group 2 (n=100), Working in chemical industry group 3, (n=90), Metal work and electrical work group 4 (n=80).

Sampling

The unmarried individuals were advised to avoid masturbation for 3 days and married individuals to avoid sexual intercourse for at least 4-6 days. The semen samples were collected in wide mouth sterile disposable plastic containers. The semen samples were incubated at 37°C for 30 minutes to liquefy.

The parameters semen volume, sperm concentration, total sperm count, sperm grade activity, sperm motility percent, sperm vitality percent, and sperm morphology percent were determined from liquefied semen according to WHO laboratory guidelines.

The volume of ejaculate was measured by using a calibrated cylinder. The sperm concentration was estimated by multiplying the mean of sperm number in ten fields with 10. Total sperm count=sperm concentration x volume. For assessment of sperm motility a minimum of around 200 sperms should be counted, both motile and immotile sperms are counted in at least 5 separate microscopic fields.

The motility of spermatozoa in each sample was graded according to movement. No sperm movement=0, Sperm movement but not in the forward direction=1, sperm movement but slow in the forward direction=2, sperm movement in the forward direction with good speed and almost in a straight line=4 and sperm movement in the forward direction with great speed=4.

The samples were analyzed to evaluate sperm count in each sample. No sperm in semen ejaculate named as azoospermia. Sperm count in semen less than 20×10^6 /mL was termed as oligospermia. Sperm count equal to or more than 20×10^6 /mL was termed as normal sperm count. All the samples were collected in the research laboratory home brought samples were not included in this study. The volunteer workers were picked from OPD of Social Security Hospital, Manga Mandi. This hospital is built for the workers and their families working in different factories. More than one thousand patients attend the OPD of this hospital.

STATISTICAL ANALYSIS

All semen samples were analyzed for normal sperm morphology, semen volume, sperm count in the ejaculate, movement of sperm in the forward direction according to WHO guidelines.

Analysis of data was performed by using SPSS (Version16) in home computer. Less than 0.05 of P value was taken as significant value.

RESULTS

Age Groups	n	Azoospermic	Oligozoospermic	Normal
≤ 20	06	NIL	03 (50%)	03(50%)
20-35	323	25(7.7%)	49 (15%)	249(77%)
35-50	71	15 (21.1%)	09 (12.6%)	47(66.1%)

Table Group 1: Effect of Working in Textile Industry

Age Groups	n	Azoospermic
Azoospermic	13	8.6%
Oligozoospermic	22	14.6%
Normal	115	76%

Table Group 2: Effect of Working in Plastic Industry (n=150)

Age Groups	n	Azoospermic
Azoospermic	15	15%
Oligozoospermic	08	8%
Normal	77	77%

Table Group 3: Effect of working in chemical Industry (n=100)

Age Groups	n	Azoospermic
Azoospermic	05	5.5%
Oligozoospermic	13	14%
Normal	72	80%

Table Group 4: Effect of working in Metal Work Industry (n=90)

Age Groups	n	Azoospermic
Azoospermic	08	13.5%
Oligozoospermic	20	14%
Normal	40	80%

Table Group 5: Effect of working in Electrical Industry (n=60)

Groups	Azoospermic	Oligozoospermic	Normal
Textile Industry	13	22	115
Plastic Industry	15	08	77
Chemical Industry	05	13	72
Metal work and Electrical	08	20	32
Total	41	63	296
	10.25%	15.75%	74%

Table Summary of effects of occupational exposure on sperm count

DISCUSSION

Male infertility is a major health hazard implicated by industrial pollution, Pesticides, phthalates and many chemical alike effect semen quality and quantity. Exposure to environmental toxicants and chemicals that disrupt sperm production or the function of reproductive hormones leading to disturbed sperm count or quality. Sperm production and sexual hormones are severely affected by prolonged exposure to heavy metals, radiation and heat. Animal studies have shown that some pesticides and PCBs can bring hormonal changes leading to decrease fertility

by affecting hormones. Pesticides, glycol ethers, printing adhesives, metals like lead, cadmium and mercury are also known to have adverse effect on sperm production and ultimately count^{2,4}. Massive urbanization, industrialization and pollution of the healthy natural environment by hazardous agents has affected the quality of semen and sperm count in the world in the past ten years¹⁵.

In our study (group 2), azoospermia was analyzed to be around in 8.6% and oligospermia in 14.6% among the workers in textile industry. The textile wet processing includes the use of dyes for

coloration. Therefore, textile industry is one amongst other industries which cause pollution and environmental hazard. It is quite clear that textile wet processing includes certain chemicals and auxiliaries. They have the potential to cause environmental hazards and adverse effects on the quality and motility of the sperms⁶.

In our study (group 3), the incidence of azoospermia was analyzed in 15% and oligospermia in 8% amongst the workers in Plastic Industry. Studies have shown that men's sperm reduction over the past few decades may be related to the use of phthalates as softeners.

In our study (group 4), the incidence of azoospermia was observed in 5.5% and oligozoospermia in 14% among the workers of chemical industry, where they work on different types of chemicals. Different chemicals like pesticides, insecticides, alkylphenolic agents and phthalates are hazardous to sexual hormones and affect on body cells. Human exposure to these chemicals is inadvertent.⁷ These pollutants of the natural environment has been central to play a role in the pathology of hazardous effects on sexual health, poor semen quality, sub fertility, decrease in sex to birth ratio. This ultimately increases the chances to develop male reproductive tract abnormalities ultimately leading to infertility.⁸ If a person is heavily exposed to a single chemical or to different chemical at low intensity, ultimate results will be the same as stated in many studies conducted in many developed countries having lots of industries. The chemicals such as phthalates which are an integral part of baby milk, potato chips consumed by younger population which could be a source of infertility later on. Testicular germ cells can be damaged or destroyed by these chemicals. The products become contaminated by these chemicals during packing or while consuming by the consumer having similar results later on. The chemical organochlorine in the formation of pesticides is considered very dangerous one. When someone is exposed to these pesticides, affects the motility of sperms, more abnormal sperms with decrease ability to fertilize. Prolonged exposure may leads

to azoospermia in some cases or decrease motility in others ultimately leading to sexual dysfunction⁹.

In our study, (group 5) the incidence of azoospermia was observed in 3.5% and oligozoospermia in 33% among the workers in metal and electrical industry.

Heavy metals like chromium, cadmium are used in the manufacturing and packing of different materials in industry which includes toys for children, electronic items, furniture, ceramics, stationery, are not only hazardous for the natural environment but also affect the human reproductive health¹⁰. Heavy metals are commonly used in manufacturing of industrial and home made products like detergents, cosmetics, paints, textiles, plastics and pesticides, decrease the sperm count in metal and electrical industry as low as 5 million per mL¹¹.

The men working in metal industry get exposed to a large number of dangerous contaminants such as steel and lead. Especially those who weld the metals are at higher risk of developing infertility related problems because they get more exposed to the metals¹³. These men had a greater risk for poor sperm quality and reduced fertility¹². One of the Canadian study shows that there is association of poor sperm quality and metal exposure but it is not linked to reduced fertility¹⁶.

CONCLUSIONS

The findings of our study revealed a relationship between workers nature of work and quality of sperms. Because sample size of our study was relatively small, therefore a large population study should be conducted to support the results of this study as this could affect a large population sector. The findings of our study strongly suggest that there is strong and steady relation that some pesticides besides DBCP, ethylenedibromide etc. affect number of sperm and are hazardous to sperm motility¹⁵. Despite their restriction epidemiological studies advocate understanding of factors that affect sperm quality. In cases of well established and arguable perilous factors it is essential to minimize vulnerability of men to these factors¹⁶.

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A person who never made
a mistake never tried anything new.

Albert Einstein

